Patent claims:

1. A method for producing mirror facets for facet mirrors in illuminating devices for projection exposure machines in microlithography by using radiation in the extreme ultraviolet region, wherein individual tilting angles are recessed into an optical surface (2) of the mirror facet (1), preferably a surface with tilting angles relative to a reference surface of the mirror facet is machined into or on said optical surface.

2. The method as claimed in claim 1, wherein the optical surface (2) comprising a very high aspect ratio, and after being recessed or machined the mirror facet (1) is subsequently provided with a reflecting layer on the optical surface (2), and then the mirror facet (1) is arranged on a mirror support body.

3. The method as claimed in claims 1 or 2, wherein the surface (2) of the mirror facet (1) is of plane, spherical or aspheric design.

4. The method as claimed in claim 1 or 2, wherein two tilting angles are recessed into the optical surface (2) of the mirror facet (1).

5. The method as claimed in claim 1 or 2, wherein for setting a tilting angle φ_x, the mirror facet (1) is brought between two bearing bodies (3) with oblique locating faces and held there.

6. The method as claimed in claim 1 or 2, wherein a tilting angle φ_y of the mirror facet (1) is set by a screw device (4), acting on a surface of the mirror facet (1) that is situated opposite the optical surface (2).

7. The method as claimed in claim 5 or 6, wherein the tilting angles φ_x and φ_y are simultaneously recessed into or formed on the optical surface (2) of the mirror facet (1).

8. The method as claimed in claim 1 or 2, wherein for setting tilting angles φ_x and φ_y, the mirror facet (1) is arranged on a support body (6) in a machining region of a machining tool (5), defined abaxially relative to an axis (7) of the machining tool (5), a surface of the machining tool (5) that machines the mirror facets (1) being designed as a spherical or aspheric surface.

9. The method as claimed in claim 8, wherein the mirror facets (1) are mounted on the support body (6) by auxiliary members.

10. The method as claimed in claim 8, wherein the mirror facet (1) is fixed on the support body (6) in a positioning and holding device (9).

11. The method as claimed in claim 10, wherein the mirror facet (1) is aligned in the positioning and holding device (9) on inner surfaces of a U-shaped body element (10).

12. The method as claimed in claim 11, wherein the positioning and holding device (9) is positioned on the support body (6) by centering pins (12) and is screwed on.

13. The method as claimed in claim 8, wherein the mirror facet (1) is mounted in a structural unit (16), the structural unit (16) subsequently being arranged at a defined abaxial position on the support body (6).

14. The method as claimed in claim 13, wherein the structural unit (16) is fixed on the support body (6) by at least one of the fastening techniques using magnetic or vacuum

clamping or by wringing.

15. The method as claimed in claim 13, wherein the structural unit (16) is bonded or cemented on the support body (6).

16. The method as claimed in claim 1 or 2, wherein the mirror facet (1) is arranged arbitrarily on a support body (6) in the machining region of a machining tool (5), a surface of the machining tool (5) that machines the mirror facets (1) being designed as a spherical or aspheric surface, the required tilting angles being recessed into the support body (6), the mirror facet (1) being arranged on an oblique locating surface produced by the recessing of the tilting angles.

17. The method as claimed in claim 1 or 2, wherein the mirror facet (1) is arranged arbitrarily on a support body (6) in the machining region of a machining tool (5), a surface of the machining tool (5) that machines the mirror facets (1) being designed as a spherical or aspheric surface, an auxiliary body (8) corresponding to the required tilting angles being mounted on the support body (6), the mirror facet (1) being arranged on the auxiliary body (8).

18. The method as claimed in claim 16 or 17, wherein the tilting angles being corrected by an amount caused by a deviation of a mirror normal from a tool normal at a mirror midpoint.

19. A facet mirror comprising a multiplicity of mirror facets in illuminating devices for projection exposure machines in microlithography making use of radiation in the extreme ultraviolet region, the mirror facets each comprising a reflecting optical surface, and the mirror facets being arranged on a mirror support body, wherein the optical surfaces (2) of the mirror facets (1) are each provided with individ-

ual tilting angles.

20. The facet mirror as claimed in claim 19, wherein the surface geometry of the mirror facets (1) is plane, spherical or aspheric.

21. The facet mirror as claimed in claim 19, wherein two tilting angles are recessed into the optical surface (2) of the mirror facet (1) or a surface with tilting angles relative to a reference surface of the mirror facet (1) is machined into or on said optical surface.

22. The facet mirror as claimed in claim 19, defined by use at wavelengths of $\lambda < 200$ nm.

23. A positioning apparatus for a mirror facet on a support body, whereas tilting angles are recessed into an optical surface (2) of the mirror facet (1) or a surface with tilting angles relative to a reference surface of the mirror facet (1) is machined into or on said optical surface, the apparatus comprising

- an U-shaped body element (10), the mirror facet (1) being introduced into a cut-out in the U-shaped element (10),
- end measures (11) for fixing a mirror facet position, and
- clamping elements (13, 13') for pressing the mirror facet (1) against the end measure (11).

24. The apparatus as claimed in claim 23, wherein the U-shaped body element (10) is positioned on the support body (6) by centering pins (12), or is permanently connected to the support body (6).

25. A positioning apparatus for positioning a mirror facet on a support body, whereas tilting angles are recessed into an optical surface (2) of the mirror facet (1) or a surface

with tilting angles relative to a reference surface of the mirror facet (1) is machined into or on said optical surface, the apparatus comprising

- a mirror facet support (17) on which the mirror facet (1) is mounted,
- a locating element (19) that is mounted on the mirror facet support (17), the mirror facet (1) being arranged on a free side of the locating element (19),
- a clamping element (20) that is mounted on the mirror facet support (17), a free side of the clamping element (20) being arranged on a free side of the mirror facet (1), and
- auxiliary elements (21) for enlarging the machining area of the mirror facet (1).

26. The apparatus as claimed in claim 25, defined by being wrung on the support body (6).

27. A facet mirror comprising a plurality of mirror facets in an illumination device for projection exposure machines in microlithography, making use of radiation in the extreme ultraviolet region, the mirror facets each comprising a reflecting optical surface, and the mirror facets being arranged on a mirror support body, wherein at least one mirror facet (33,34) has at least one optical surface (37,38) whose normal or normal plane is tilted by tilting angles relative to the normal or normal plane of a reference surface of said mirror facet (33,34), and wherein the geometrical projection of the optical surfaces (36,37 or 38,39 or 37,38) of two adjacent mirror facets (32,33 or 34,35 or 33,34) with at least one tilted optical surface onto the support body (31) cover at least an area of the same size as the geometrical projection of the respective mirror facets onto said support body (31).

28. A facet mirror of claim 27, wherein the optical surfaces (36,37,38,39) of the mirror facets (32,33,34,35) comprise a plane, spherical or aspherical geometry.

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